

Establishing Wichita's Ecological Footprint

Living within the means of what nature can provide



**City Council Workshop
Environmental Services
November 27, 2007**

Workshop Presentation

- **Historical Perspective**
- **Background**
- **2007 Winter/Spring Actions**
- **Defining Concepts**
 - **Environmental Systems**
 - **Sustainability/Ecological Demand**
 - **Ecological Footprint**
- **2007 Summer/Fall Actions**
- **ES Recommendations**

Historical Perspective

- **City of Wichita has a long-standing commitment to environmental quality...**
 - **Wichita-Valley Center Flood Control (Big Ditch)** – continues today (1959)
 - **Energy practices in City buildings** continues today (1977)
 - **Gilbert and Mosley GW Cleanup** continues today (1990)
 - **Air Quality 33-50 Program** - Sedgwick Co was one of top 10 counties having highest chemical air emissions in the US, Emissions Reduction Program (1988-1997) – EPA recognized community for achieving goal!
 - **Air Quality Task Force** continues today (1998)
 - **Landfill methane recovery** continues today (1998)

Historical Perspective

- **Wichita environmental projects continued . . .**
 - **Street light change out** – ongoing (1980s)
 - **Cheney Watershed Project** continues today (1993)
 - **Equus Beds Recharge Project** continues today (1993)
 - **Rail Corridor Overhead Trains** continues today (1990s)
 - **Intelligent Transportation Systems/Traffic lights change out** – ongoing, more efficient bulbs (2002)
 - **Parks Dept Expands Tree Planting and Pesticide-Free Parks** continues today (2002)
 - **Completed Transit Bus Change Out** – more efficient buses with reduced air emissions – no black smoke! (2004-2006)
 - **Many, many more....**

Background

- **In July, 2006**, Mayor/Council asked ES to evaluate the requested endorsement of US Conference of Mayor's Climate Protection Agreement and Sierra Club's Cool Cities program - to reduce greenhouse gases (GHG)
- **In August, 2006** ES recommended the City:
 - Develop a City Gov't Energy Inventory – for Greenhouse Gas (GHG) emissions baseline
 - Establish and implement a City Operations Air Emissions Reduction Plan for Ozone and GHG
 - Establish City air emissions tracking and annual reporting program for Ozone and GHG
 - Increase City and community education and outreach
- **Fall/Winter 2006** ES held Department meetings to develop Energy Inventory and engaged volunteer Dr. Bill Wentz, Retired WSU Professor, for assistance and emission forms

2007 ES Winter/Spring Actions

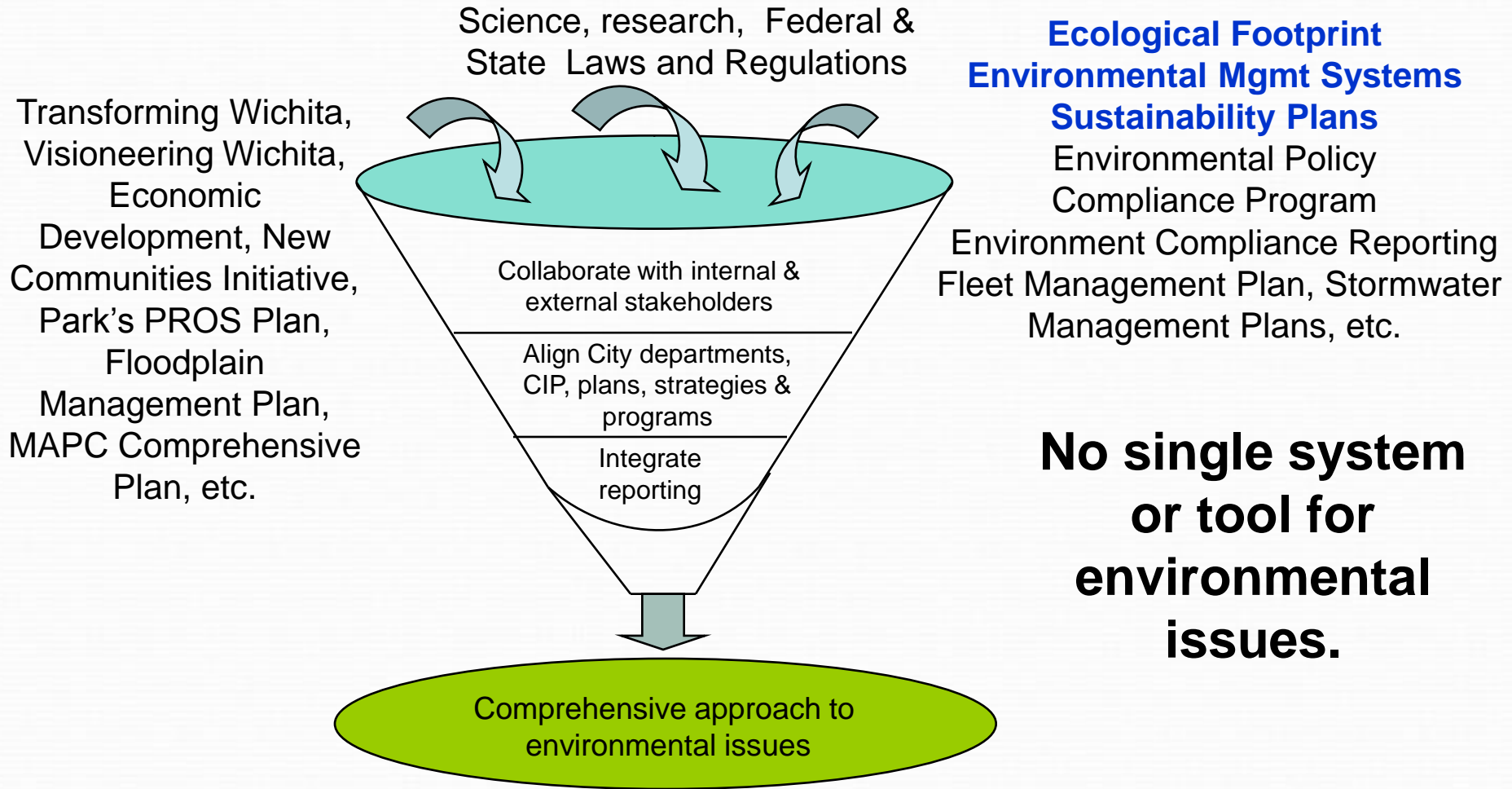
- **In January, 2007** ES began 2006 City Energy Inventory (GHG)
- **In May, 2007** City Manager attended ICMA meeting where env. management systems, sustainability and ecological footprint concepts discussed in depth
 - Each country, state, county, city, individual – has an ecological footprint and each should do its part to reduce its impact
 - Impact and consumption rates are too high for earth's capacity
 - Quality of life and sustainability requires reducing eco footprint
- CM directed ES to develop ecological footprint for City gov't operations and to make recommendations for development of citywide/community ecological footprint, action plans for compliance, air emission reductions and for city/community sustainability

Defining the Concepts

- Cities have complex environmental issues that often intersect with economic and social interests
- Federal and state laws are often unfunded mandates and resources are usually an issue
- Cities have issues in common but need local solutions
- Municipalities use various approaches including
 - Regulatory compliance programs
 - Pollution prevention/waste reduction programs
 - Environmental Management Systems
 - Strategic plans including Sustainability Programs
 - Ecological Footprint



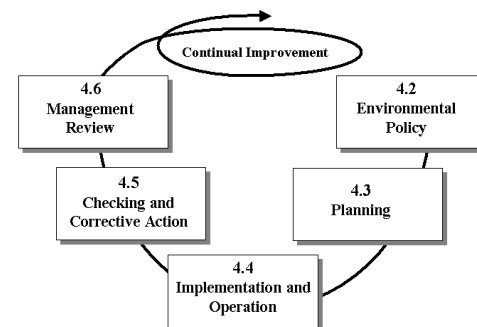
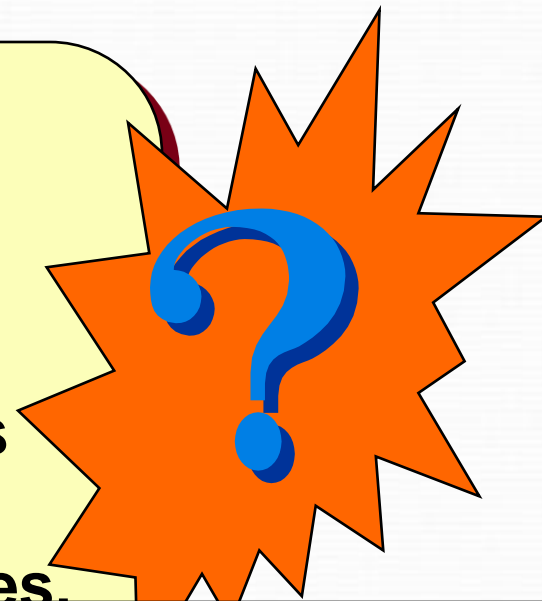
Defining the Concepts



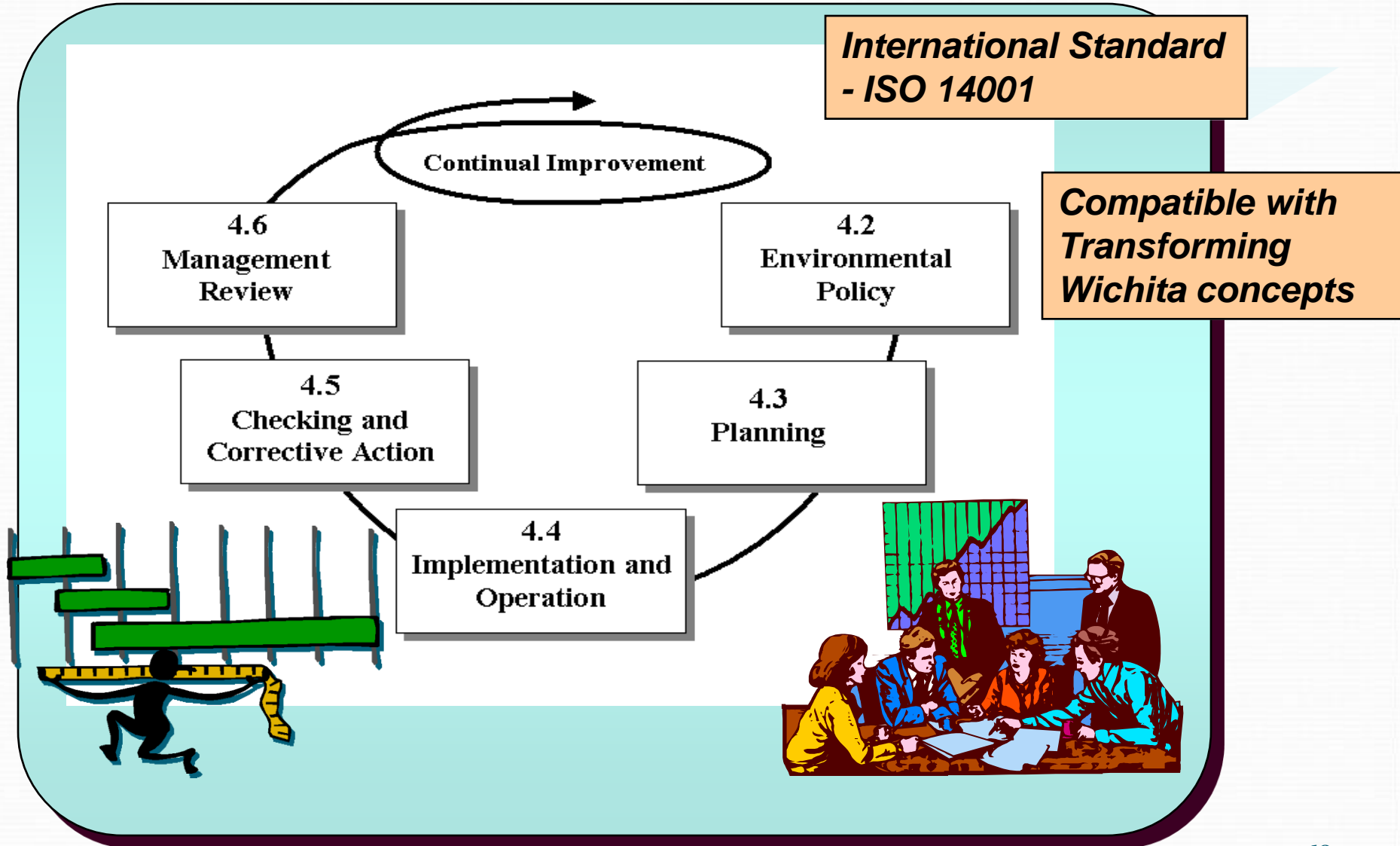
Environmental Management Systems

WHAT IS AN “ENVIRONMENTAL MANAGEMENT SYSTEM”?

The part of the organization’s overall environmental program that includes organizational structure, planning activities, responsibilities, procedures, processes, practices and resource developing, implementing, achieving, reviewing and maintaining the environmental policy.



Environmental Management Systems



Sustainability

Sustainability is a **characteristic** of a process or state that can be maintained at a certain level **indefinitely**.

The term, in its environmental usage, refers to the potential longevity of vital human ecological support systems, such as the planet's climatic system, systems of agriculture, industry, forestry, and fisheries, and human communities in general and the various systems on which they depend.

Wikipedia

Sustainable Development

Sustainable Development - is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs”

World Commission on Environment and Development, aka “The Brundtland Commission,” 1987

To achieve sustainable development, some things must grow—jobs, productivity, wages, capital and savings, profits, information, knowledge, and education—and others—pollution, waste, and poverty—must not.”

The President’s Council on Sustainable Development

Sustainable Development



RELATES TO CONSUMPTION

What on Earth Are We Doing?

- For sustainable living, Earth's resource production (supply) and use (demand) must be balanced
- Earth is like a large island
 - With limited natural resources... no place to borrow
 - Unable to dump pollution anywhere else
 - Problems are increasing at a fast rate
 - Bottom line – The Earth has a limited **carrying capacity!**
- **Easter Island – Ecological Disaster**

Complex society for 16 centuries, had to cut forests down to support community; eventually soil, water, food was depleted



Population crashed from 12,000 to 4,000 in 40 years (1680-1722)

Global Indicators of Ecological Demand



Heat waves and periods of unusually warm weather



Ocean warming, sea level rise and coastal flooding



Glaciers melting



Arctic and Antarctic warming



Spreading disease



Earlier spring arrival



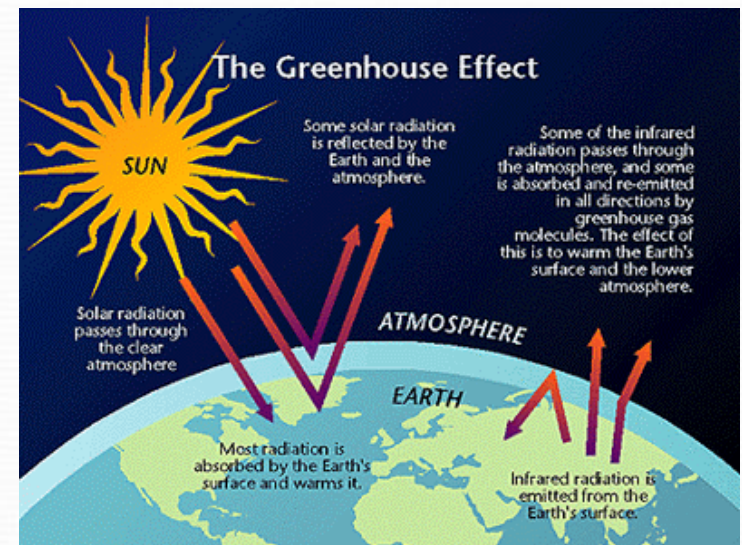
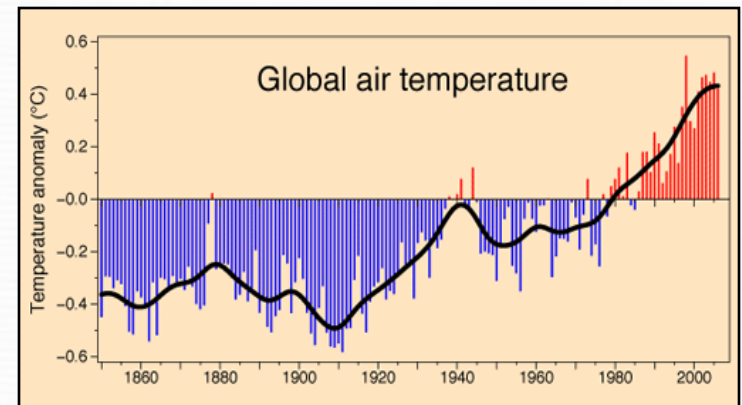
Plant and animal range shifts and population changes



Downpours, heavy snowfalls, and flooding



Droughts and fires



U.S. Indicators of Ecological Demand



Ks Indicators of Ecological Demand



2007

- Greensburg Tornado
- Coffeetown/SE KS Flooding



Elementary School



Local Indicators of Ecological Demand

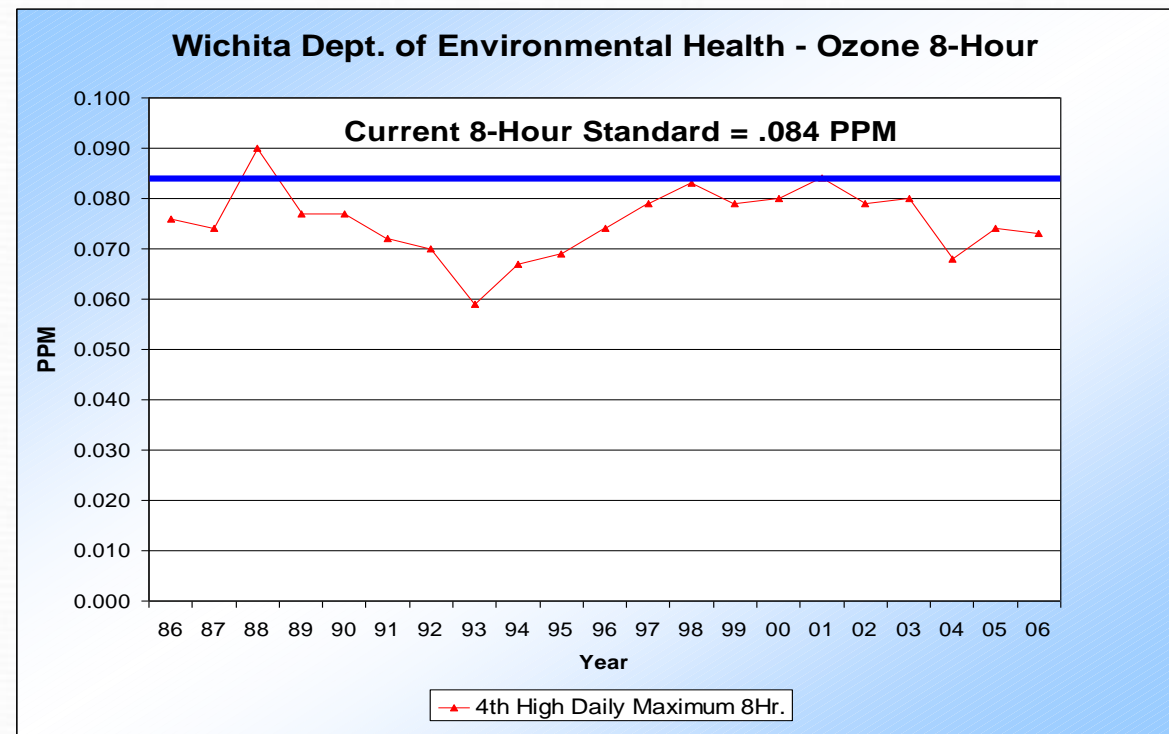
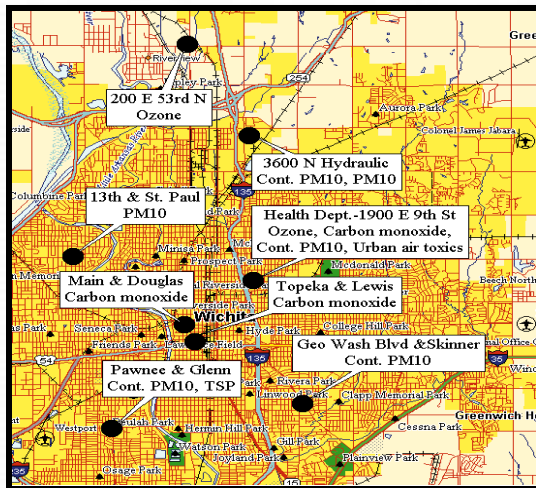
Wichita Area Flooding, Ice Storms etc....



Local Indicators of Ecological Demand

Increased Air Pollution

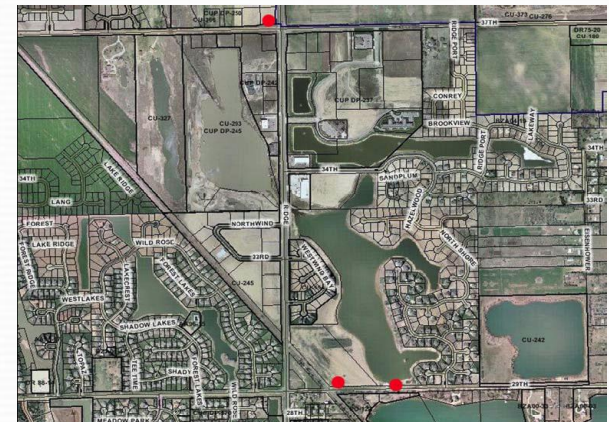
- ✓ Ozone and CO₂
- ✓ Nitrogen Oxides
- ✓ VOC's



Local Indicators of Ecological Demand

Local water quality

- ✓ Arkansas River
- ✓ Cheney Lake
- ✓ Equus Beds Groundwater
- ✓ Downtown Groundwater (GilMo/NIC)
- ✓ Stormwater
- ✓ Ponds and lakes



Natural Resource Consumption

- Use of the world's resources
 - Energy is the most basic natural resource - 9% of energy from renewable sources, 91% from nonrenewable sources
 - Earth's population has doubled in last 40 years, but land available for food production is shrinking and so are clean water supplies
 - CO₂ emissions increased by 31% since 1750 – half coming in the last 50 years
- North Americans biggest users of the world's energy:
 - 5% of planet's population uses 24% of total commercial energy supply
 - Americans waste over 40% of this energy in completely avoidable actions with inefficient home heating systems, appliances, lighting, water heaters and automobiles
- What is Wichita's consumption rate? How can this be measured and compared?

Consumption Can be Measured by An Ecological Footprint

Ecological Footprint:

Land necessary to sustain resource consumption and waste discharge

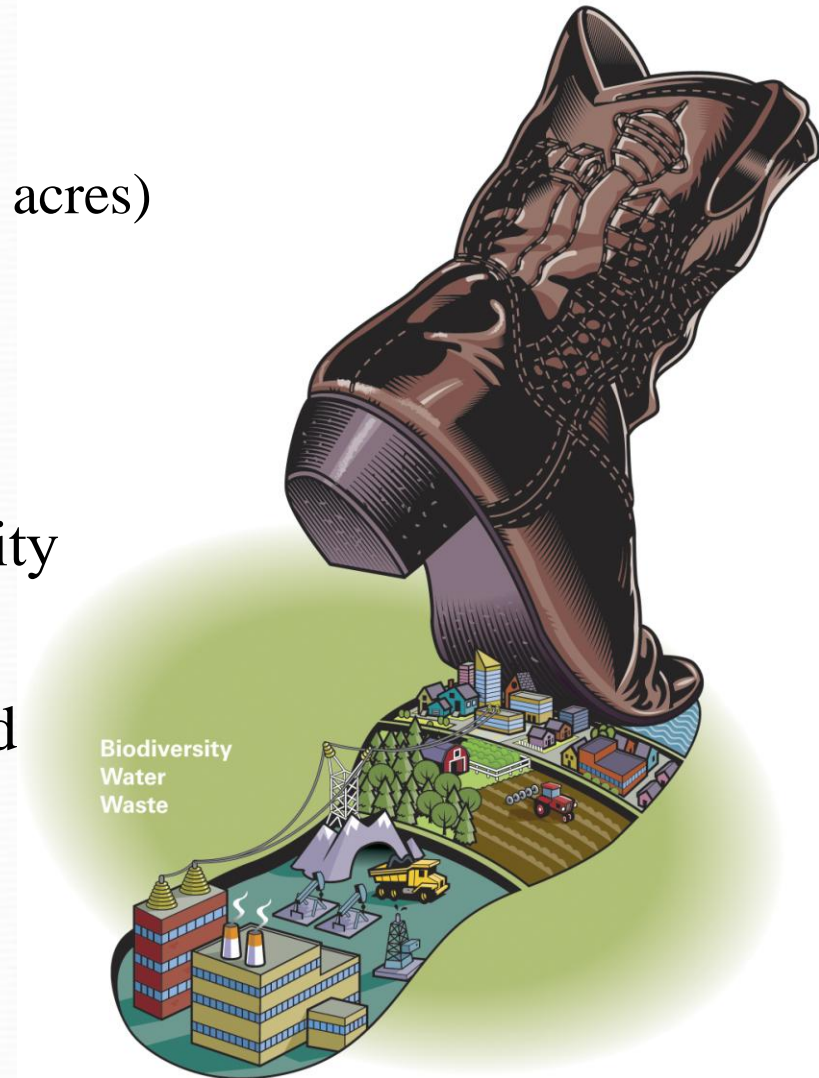


Our Ecological Footprint, by M. Wackernagel and W. Rees

Can be used to determine the ecological impact of project, an individual, community, local government, country, continent, and our planet

Ecological Footprint = Consumption

- Measures nature's ability to provide resources and absorb waste (Supply, in acres)
- Measures the amount of resources we consume (Demand, in acres)
- Can compare consumption footprint relative to the earth's carrying capacity
- Can be used to:
 - Evaluate and measure impact and improvements
 - Make policy, plans, & decisions
 - Communicate with public and stakeholders



Footprint - like a financial budget ...

- U.S. citizens are living beyond our means by:
 - Consuming resources faster than the earth can supply
 - Creating more waste than the earth can absorb
- Must start giving back (for sustainability) by:
 - Using less natural resources
 - Eliminating or reducing wastes
 - Cleaning up land, soils, ground and surface water for reuse
 - Taking actions to offset consumption – plant trees, reduce footprint

Ecological Footprint

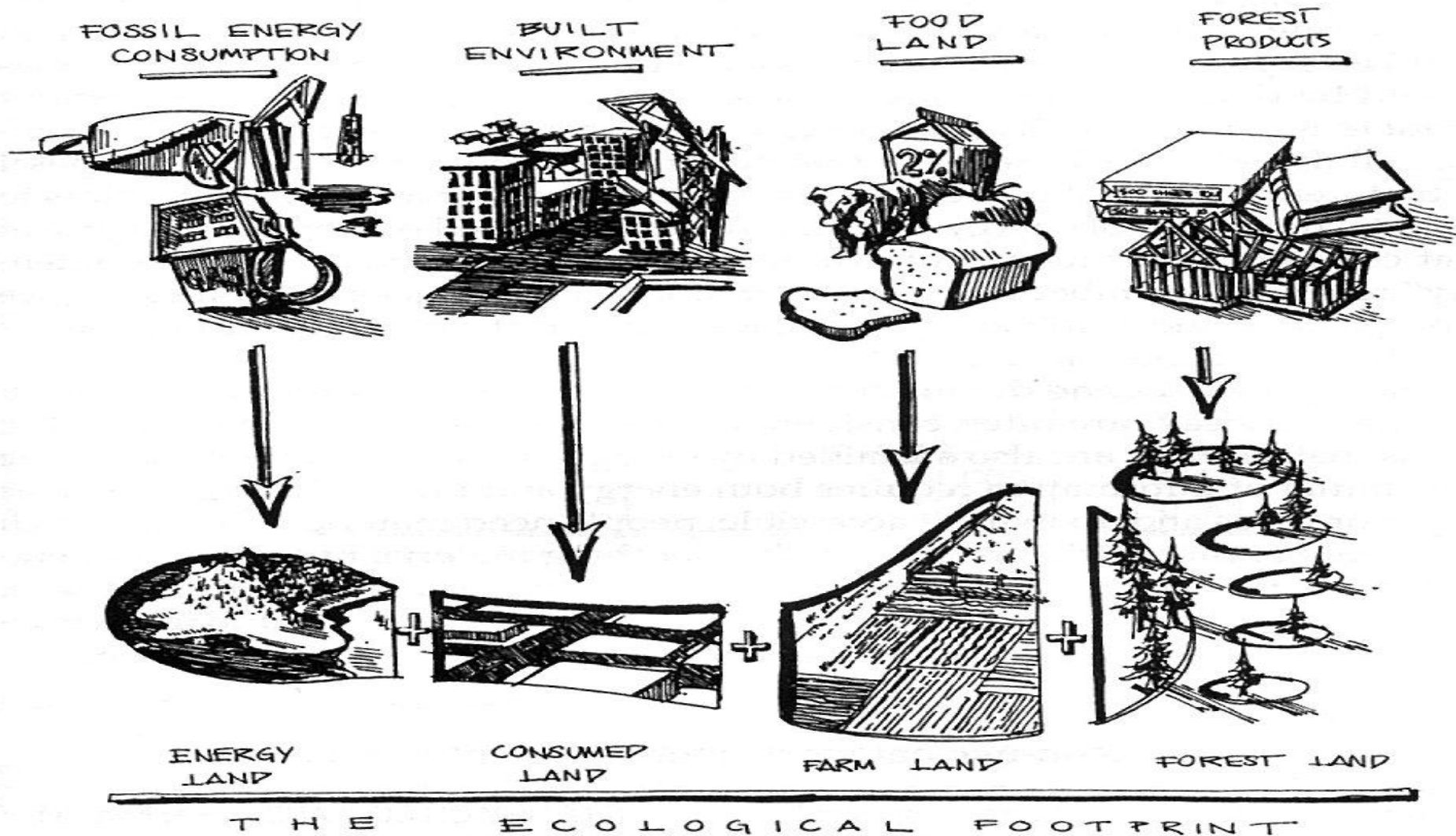
Average Individual Footprint (Acres)

United Arab Emirates	26 Acres
United States	24 Acres
Canada	19 Acres
Australia	17 Acres
United Kingdom, France	14 Acres
Germany, Japan, Russia	11 Acres
Mexico	6 Acres
Brazil, Argentina	5 Acres
China	4 Acres
Nigeria, Colombia	3 Acres
India, Cameroon	2 Acres
Somalia, Afghanistan	<1 Acres
All Countries =	5.75 Acres

- If we leave only 12% of the biosphere for other species, there would only be **5 acres available per person** -- this means that we humans overshoot the mark by at least 20% or ~ 1 acre/person.
- The worldwide average per person footprint is 5.75 acres
- In the United States, the average individual footprint is 24 acres/person

- What is the footprint of a Wichita citizen ??????
- If Wichita's footprint was 25 acres per person and people around the world had Wichita's footprint, it would require five earth-sized planets to support all of us

Ecological Footprint



Footprint Components and Issues

- **Energy**
- **Transportation**
- **Water and wastewater**
- **Land and developments**
- **Waste/resource management**
- **Construction**
- **Biodiversity**
- **Consumption of goods and services**
- **Local/regional food production**

Wichita Area

- What's going on in our community?
- What can/should we do?
- What are the biggest risks and costs of not acting?
- What components impact our Quality of Life?

Footprint - Value-added Tool for Cities

Environment, economy, health and well-being considered

- More than a measurement system;
- Analysis identifies strategies to change human behaviors;
- Tool to engage City & community in dialogue & problem-solving exercise leading to ownership & action; a common thread for Public info; and
- Provides key information for sustainable development

Examples: Petaluma, CA used Eco Footprint as criteria for selecting WWT Option; Sonoma County, CA uses it for zoning and open spaces decisions: Calgary, Canada used it to justify recycling cement for better quality road surfaces and saved 40% of the cost and 75,000 Tons of Co2 emissions

2007 ES Summer/Fall Actions

- ES took steps to create a City Gov't Eco Footprint
 - Communities already doing this Calgary; Marin Co, CA; Sonoma, CA, etc....
 - Realized the data available only for one component, the Energy (Carbon) Footprint; same as for Energy Inventory for Greenhouse Gases
 - To prepare a full Eco Footprint – need a computer model, technical expertise and national, state and local data
- ES contacted Dr. Bill Wentz
 - Dr. Wentz agreed to help with Energy Footprint
 - Additional technical expertise required for entire Eco Footprint development

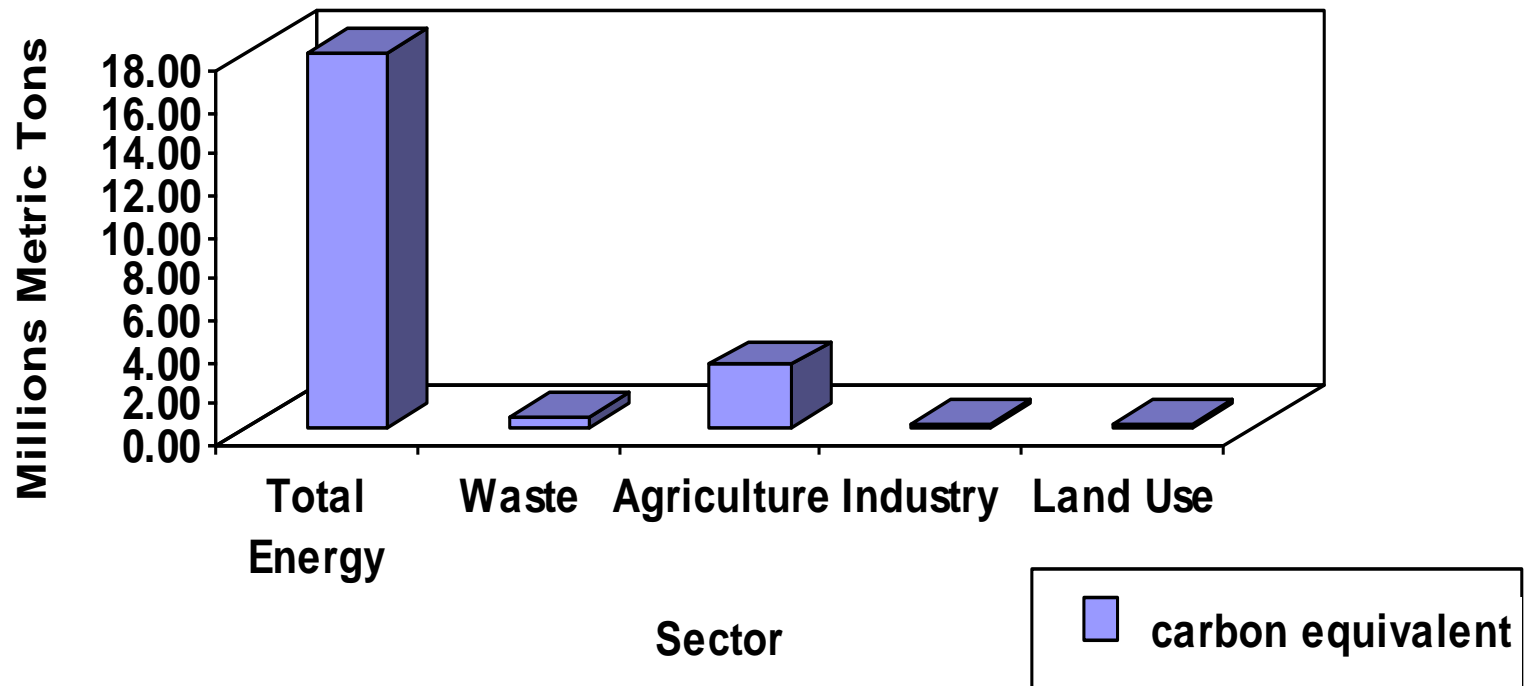


Developing a City Gov't Energy Footprint Baseline

- While data requirements was same as originally planned, 2006 energy inventory (GHG), different analysis required
 - 2006 energy and transportation data obtained from all City departments and provided to Dr. Wentz
 - Fuel usage - electricity, natural gas, gasoline, diesel – obtained for buildings, processes and vehicle fleet
 - Employee commute info and department travel
 - Usage of chemicals – Freon and other refrigerants, others
 - Dr. Wentz, other WSU Professors and students took the data and prepared our energy footprint in tons of Carbon equivalents (although full eco footprint uses acres)
- **Energy Footprint for City operations calculated to be 185,636 Tons CO₂e (equivalent)**

KS Greenhouse Gases (CO₂e)

KANSAS GREENHOUSE GAS EMISSIONS AND SINKS INVENTORY: SUMMARY



Comparing City Gov't Energy Footprint

To give you an idea about how the footprint consumption idea works – using an EPA website calculator our energy footprint of 185,636 tons of CO₂e (equivalent) translates to one of the following:

- 15,809,771 tree seedlings grown for 20 years
- 513,818 acres of pine or fir forests storing carbon for one year
- 5,071 acres of forests preserved from deforestation for one year
- 133,459 passenger cars driven for one year
- 70,225,636 gallons of gasoline used in one year
- 3,133 rail cars of coal burned in one year

Comparison of Wichita and Seattle, WA.

Energy Footprint Data

Resources	Wichita CO₂e (corporate) in Tons	Seattle CO₂e (corporate) in Tons	% Diff.
Electricity	155,876	313,914	50%
Natural Gas	4,350	13,529	32%
Propane	28	NA	NA
Other Gases (Refrigerants)	215	12	1792%
Transportation	25,167	34,875	72%
Total	185,636	362,330	51%

# of City Employees	3,300	9,000	37%
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Population (2,000 Census)	344,284	563,374	61%
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City Energy Footprint Data Issues

Energy Footprint likely underestimated due to fact that ES:

- Did not obtain City contractors footprint data – roads built, construction activities, repairs made, refrigerant used to repair air conditioners at City, etc.
- Did not obtain all carbon equivalents generated by city operations – wastewater treatment generates methane gas, maybe others

Also, credit offsets also not taken into account either:

- Methane recovery at Brooks landfill
- Trees planted each year by Parks Department
- Recycling efforts by City departments

NOTE: Energy Footprint Data should not be used as final baseline until data is re-evaluated during full Eco Footprint development

Benefits to Reducing the City's Energy Footprint

The economics (cost savings, health and environment improvements) of reducing our energy footprint (air pollution and greenhouse gases):

- Potential to reduce operating costs through - energy conservation, fleet fuel and maintenance, recycling of materials, waste prevention and reduction
- Better air quality improves public health by reducing respiratory diseases, such as bronchitis and asthma, and reduces urban smog helping City to stay in compliance with Federal Ozone standards
- Planned progress to help reduce climate change impacts
- Etc....

City Energy and Waste Costs (2006)

• Electricity	\$11,700,874
• Water & Sewer	\$ 908,224
• Gas	\$ 1,653,117
• Trash	\$ 222,139
• Landfill Fees	\$ 129,320
• Hazardous Waste	\$ <u>48,027</u>
TOTAL	\$14,661,701

Important Community Questions

Visioneering and Quality of Life Issues . . .

- How do we effectively communicate over consumption of natural resources globally, nationally, and locally?
- How does Kansas and Wichita compare to others?
- What's the impact if we continue at the current rate?
- Are we missing out on opportunities to conserve and preserve our resources and reduce costs?

ES Recommendations

- Council - Adopt a resolution for sustainability, air emissions reductions, energy and water conservation, public health improvement, and environmental risk reduction
- City Management/Departments - Develop and implement City-wide policies and coordinated plans/programs/tools:
 - Environmental Management Systems and Assessment Program
 - City and Community Ecological Footprint
 - Develop Sustainability Plan with strategic programs to address all footprint components including:
 - Air Emissions Reduction and Energy Conservation – develop baseline and forecast years to target reductions
 - Water Conservation and Surface Water Quality Improvement
 - Waste Reduction, Reuse, Recycling
 - Annual Report for City and Community Environmental Efforts

Recommended - Sustainability Plan Elements

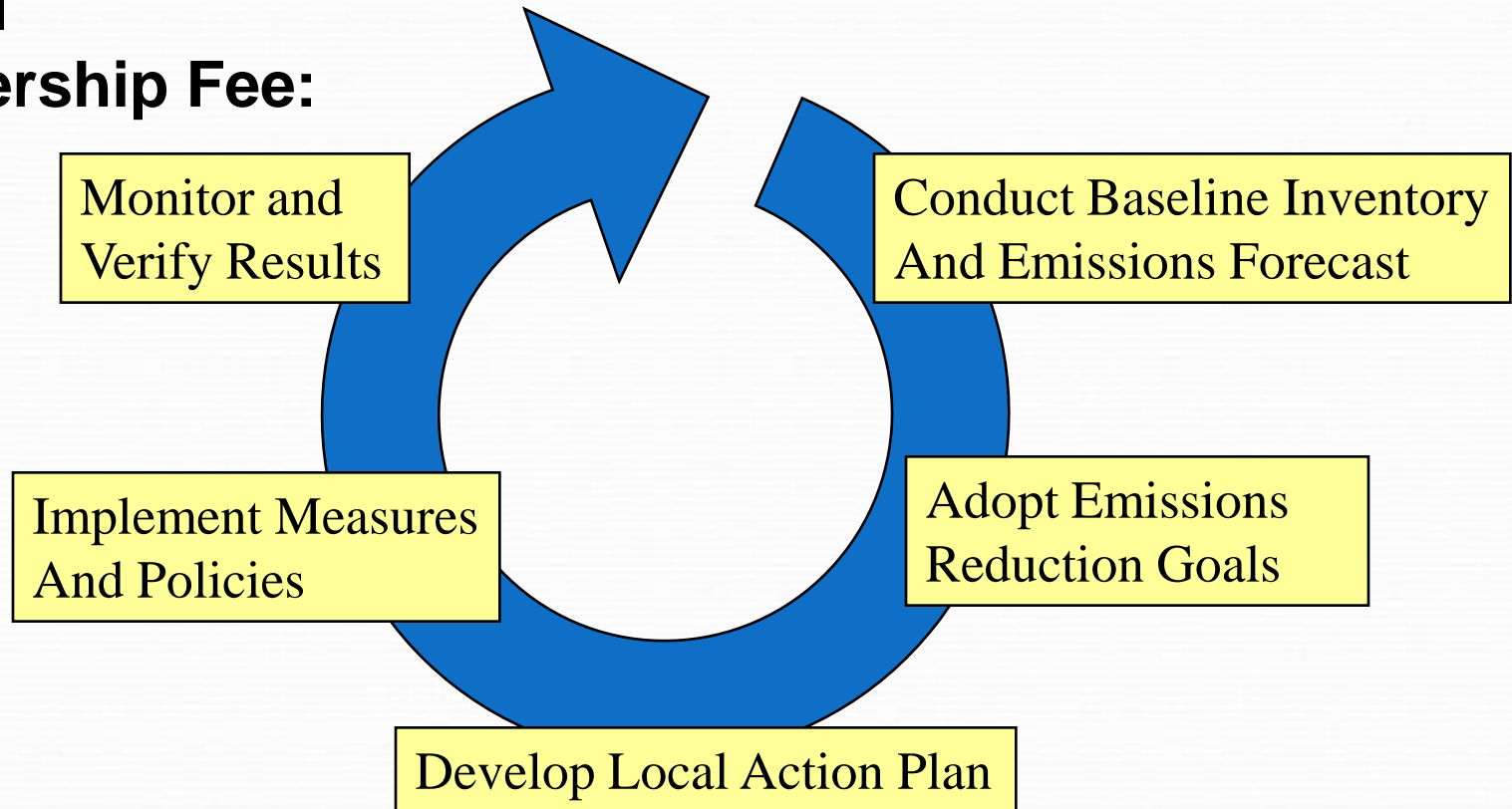
- Institutionalize sustainability as a Transforming Wichita value
- Conduct a baseline inventory based on ecological footprint components for a base year and future forecast year
- Adopt a footprint reduction target for the forecast year
- Develop a local action plan
 - Timeline
 - Identify Funding
 - Departmental responsibility
 - Public awareness and education
- Implement policies, practices and measures
- Monitor, verify and report results

ES Recommendations

- Roles and Responsibilities
 - ES assigned Env. Management Systems and Assessment Program, Ecological Footprint Development/Tracking and Reporting
 - Other plans and programs assigned to City operating depts.
- ES Resources Needed
 - All City departments - provide a representative to act as environmental coordinator (with existing staff)
 - City Join International Council for Local Environmental Initiatives (ICLEI)/Cities for Climate Protection that provides technical services and software tracking for City energy and (Carbon/GHG) tracking - Annual Membership Fee
 - Obtain technical services funding for Eco Footprint
 - Education Program/Report/Printing Fees and Training

ICLEI: Cities for Climate Protection

**Annual
Membership Fee:
\$2750**



**300 US Cities Are ICLEI Members including:
KS, CO, OK, MO, IO**

Costs to Develop Eco Footprint

Technical Services:

- Option 1 - Basic “Snapshot” of the City: \$20,000
 - Calculates the ecological footprint associated with all City Operations
 - Considers the environmental effects of direct operations and contractors
 - Demonstrates the footprint's reduction benefits associated with several sustainability initiatives that the City may consider such as:
 - Fleet retrofit
 - LEED standards for all public buildings
 - Installation of water/energy saving technologies
 - Wind/solar/biomass purchases
 - Carbon offsets
 - Etc.

Costs to Develop Eco Footprint

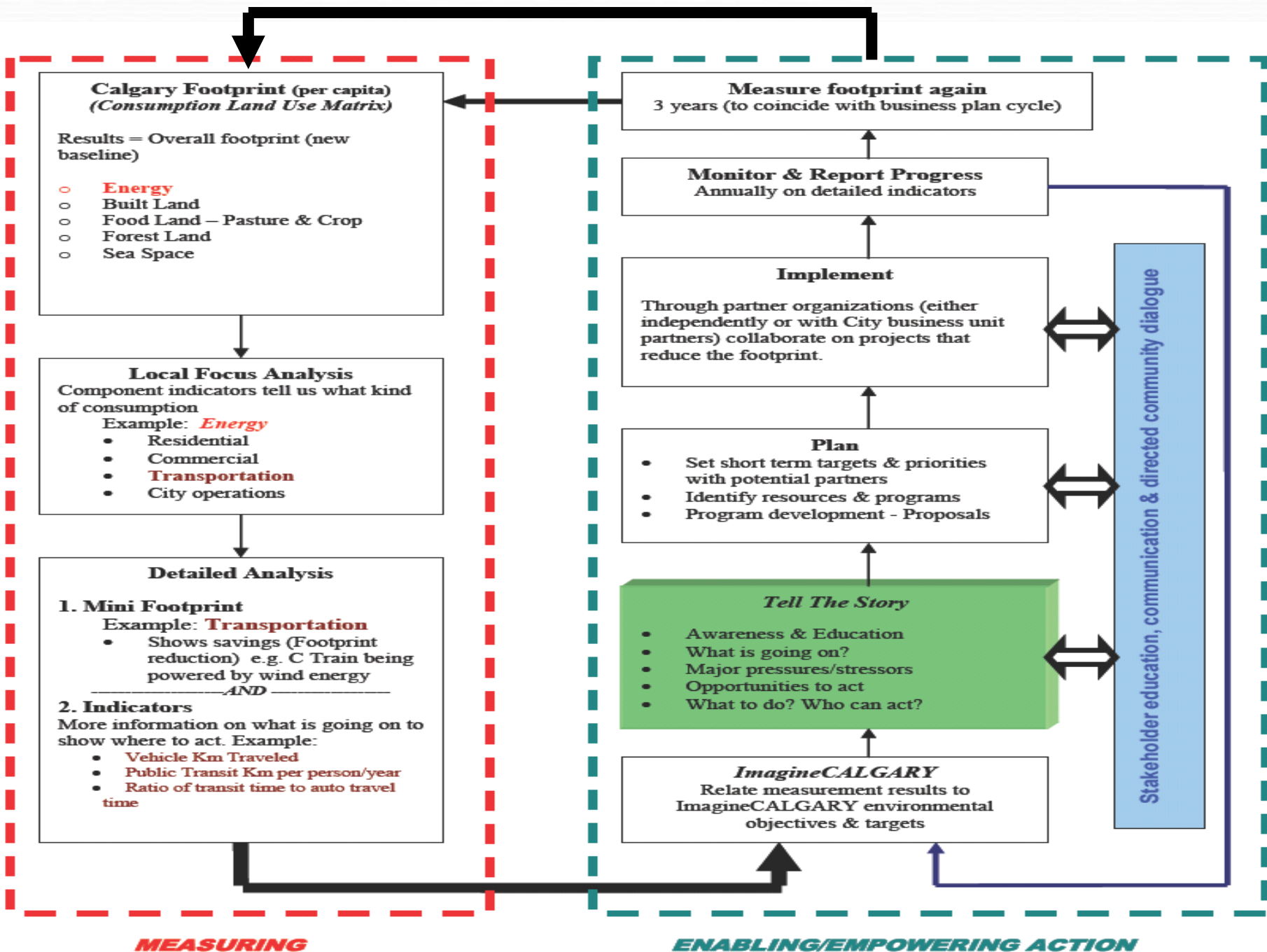
Technical services:

- Option 2 - More precise footprint: \$30,000
 - Calculates the footprint of the City as a Community
 - Relies on a combination of national, statewide, and local data.
 - Gather's local data on household consumption patterns via on-line surveys
 - Uses surveys as a vehicle to educate public about what they can do to reduce their footprint
- Option 3 - Most precise footprint: \$45,000
 - Calculates the footprint of the City/County as a Community
 - Requires more funding as the data compilation and analysis time is greater given the larger geographic focus
 - Gathers data from county residents via on-line surveys
 - Can be tailored to specific projects or adapted to planning needs

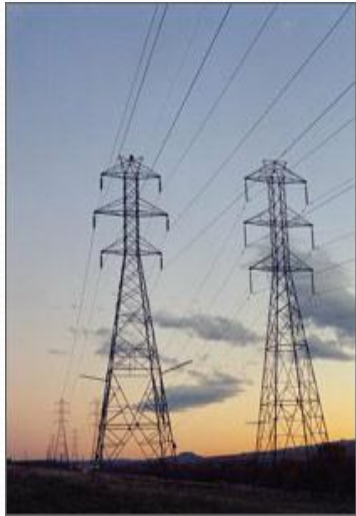
Funding Needed for Recommendations

Resource (Summary):

■ ICLEI Membership Fee (annual cost)	\$ 2,750
■ Ecological Footprint Option 3 (one time cost) Most precise footprint for City/County as Community Cost estimate for services	\$45,000
■ Printing / Publication Fees for Reports/Training (annual cost)	\$ 7,000
<hr/>	
Initial Year Cost Estimate	\$54,750
Annually Thereafter	\$10,000



Potential City-level actions - Energy



- Reduce energy use and costs by implementing energy saving policies and practices
- Increase use of public transport, and fuel efficient vehicles, goods and services
- Purchase renewable energy
- Educate city employees/ community on energy/cost saving measures, public transportation, health impacts and air pollution



Potential City-level actions: Cropland



- Purchase locally grown products
- Increase community gardens
- Encourage use of Farmer's Markets



Potential City-level actions: Forest Land and Waste Reduction



- Reduce paper use
- Reuse wood products where possible
- Recycle paper and goods
- Introduce curbside recycling



. it add\$ up.



Potential City-level action: Built Environment



- Green building standards and low-impact stormwater design
- Energy efficient appliances
- Building Infill – core areas
- Walking and transit-oriented design
- Multi occupant housing and mixed developments



Potential City-level actions - Water



- **Develop watershed restoration and protection programs and educate to protect water quality**
- **Develop programs and increase public educate to reduce water consumption and implement water conservation measures**
- **Invest in Flood Plain Management Program**
- **Improve stormwater programs**

Potential City-level actions: Biodiversity

- Increase protected spaces
- Increase/protect wetlands
- Protect and enhance wildlife edge
- Encourage backyards that support biodiversity



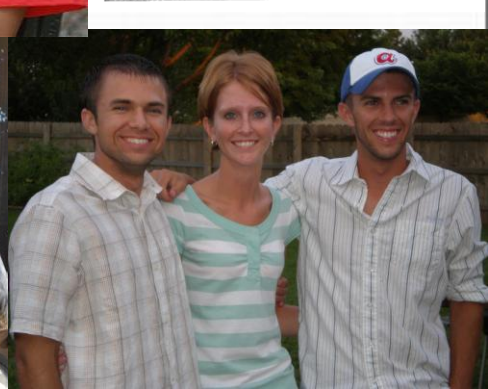
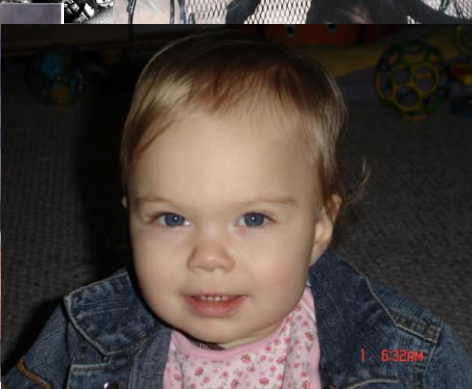
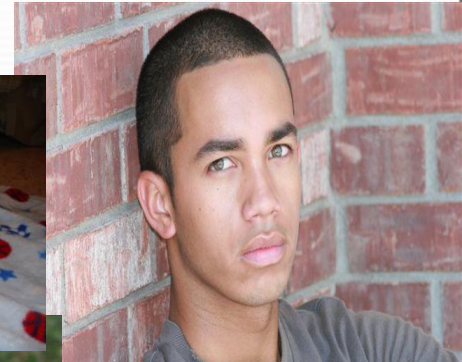
What Individuals Can Do

- Determine your ecological footprint
<http://www.earthday.net/Footprint/index.asp>
- Challenge your current behavioral patterns, particularly your consumer/consumption habits
- Understand the consequences of the decisions you make
- Take responsibility for your personal actions
- Lead by example

Env. Management Systems, Sustainability, and Eco Footprint

- Beyond compliance and continual improvement
- Potential benefits:
 - Reduce operating costs, cost efficient use of taxpayer funds
 - Improved environmental performance and reasonable care
 - Improved employee and community health and safety
 - Energy, water and materials conservation
 - Increased opportunities for innovation and best practices
 - Tools to identify priorities, make decisions and measure improvements after project implementation
 - Increased stakeholder and community involvement
 - Assurance to citizens of commitment to quality of life

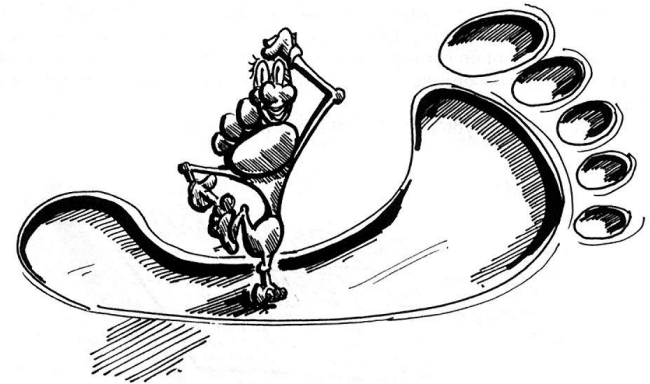
We Must Be Good Ancestors



We are what we measure



Questions?



It's time to measure what we want to be